chromate of itself is unable to diffuse in the gelatin. The contrary is easily proved. Moreover, there are a great many precipitates that give bands either in gelatin, agar, silicic acid or even in filter paper and sand. It can not be assumed, in every case, that one of the reagents is fixed. Further, the facts quoted by Dr. McGuigan in support of his hypothesis are inaccurate. Bands of lead chromate can be obtained in gelatin with the right concentrations of lead acetate and potassium dichromate, as also with silver nitrate in the gel and the dichromate in aqueous solution.

Examination of a great many different kinds of precipitate in gels and other media shows that band formation occurs only when the precipitate is extremely finely divided, or, practically, in the colloid state. If the specific surface of the precipitate is insufficient there is no banding. The experiments are made conveniently in test-tubes half filled with gel on which the liquid reagent is poured. As the specific surface increases, at first, bands of denser precipitate are formed in a diffuse column of precipitate extending down the tube. With further increase of specific surface, the bands become more marked, until, eventually, there may be no precipitate between. The formation of bands in a diffuse precipitate absolutely disproves the "supersaturation" theory.

The attractive force, the effect of which is well illustrated in Dr. McGuigan's photograph, is that of adsorption. When the precipitate is sufficiently finely divided it adsorbs the solute from the adjacent zone of gel. More solute diffuses into this zone from the regions of gel more remote, where the concentration of solute has not been diminished. But the solute is adsorbed as fast as it arrives in the neighborhood of the precipitate and is removed from solution by the excess of precipitating reagent. Thus a concentration gradient is set up towards the precipitate, and a considerable region of gel adjacent to the precipitate becomes practically devoid of solute. If the rate of diffusion into the gel of the stronger reagent is sufficient, this reagent will be able to travel through the exhausted zone until it reaches a further region of gel where there is sufficient solute to form another band of precipitate. The increasing distances apart of the bands are due to the diminishing concentrations both of the solute in the gel and of the reagent diffusing in.

The specific surface of the precipitate is influenced by the concentrations of the reaction components, by the nature of the reaction medium and by the presence of electrolytes. Generally, it is determined by the value of N in von Weimarn's somewhat indefinite formula

$$N = K.(P/L),$$

where P is the excess concentration of the substance to be precipitated, L its solubility and K is a factor representing the viscosity of the reaction medium and the physical and chemical complexity of the reaction components in solution. The formula is being investigated further. But it has been shown that the occurrence or non-occurrence, of bands of a given substance in different gels is due to the influence of the reaction medium, and that, by varying its specific surface, a substance can be obtained in the banded form, or not, as desired. For instance, silver chromate and dichromate form bands in gelatin. In agar gel they occur as black ribbon-like crystals up to several centimeters in length. By increasing the specific surface of the precipitate in agar, both salts have been obtained in a banded form even more beautiful than in gelatin.

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SPECIALIZATION IN THE TEACHING OF SCIENCE

To the Editor of Science: It is somewhat amusing to note Professor Gortner's reference to the settee of science as if it were a thing of the past, and then to find, on an earlier page of the same issue, an advertisement which calls for a professor of zoology and geology.

As a matter of fact, it would not be difficult to find scores of just such mixed professorships and instructorships in colleges all over this country. I think it would be safe to assert that it is only in the larger universities, relatively few in number, that specialization has been carried to anything like the degree suggested.

The cases of the colleges in this state may be cited as examples. In one, geology is taught by a professor of astronomy, in another by a professor of agricultural chemistry; in a third a professor of chemistry teaches mineralogy. And it is only fair to these several professors to say that in each case the instruction given is excellent.

That Maine is not unique in this respect is indicated by notices of vacancies in college faculties that have come to my attention during the past two years. In one case an instructor was needed in chemistry and geology, in another an associate professor in zoology and geology, in colleges one of which was near the Atlantic coast (not in Maine), and the other not far from the Pacific.

In my own teaching experience I held for a number of years a position in which I was expected, and did make a brave attempt, to teach chemistry, geology, botany and zoology, with a little physics thrown in for good measure; this in an institution which would be called a college almost anywhere outside of New England.

There are potent reasons why this condition of affairs exists still, and must go on existing for some time to come, whatever may be said as to its desirability; the most obvious being the limitations placed upon our colleges by lack of money. However, I am not altogether certain that the condition is undesirable.

I realize, of course, that Professor Gortner and I are not thinking of exactly the same thing. His attention is, naturally, on the more advanced courses, in which students are, and should be, in charge of more or less narrow (I use the word in no derogatory sense) specialists; mine is on the more general courses, in the conduct of which teaching ability and personality are at least as important as erudition. There is still a large and important field for the old natural-history type of instructor, and I for one sincerely hope that his species will not soon become extinct.

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AUGUSTA

SHARK AND REMORA

TO THE EDITOR OF SCIENCE: The account by Dr. Spaeth in SCIENCE of October 21 of symbiotic relations between a shark and a remora recalls some observations made by the writer in San Diego, Cal., in November, 1920. The head of a Tuna Shark, *Isuropsis glauca,* had been cut off by the writer and carried to the laboratory of the Scripps Institution, at La Jolla. After some dissections had been made there was found on the table a small remora, three inches long, that had evidently taken refuge in the mouth or gill-chamber of the shark.

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SCIENTIFIC BOOKS

Life of Alfred Newton, Professor of Comparative Anatomy, Cambridge University, 1886–1907. By A. F. R. WOLLASTON. With a preface by SIR ARCHIBALD GEIKIE. New York: E. P. Dutton & Co., 1921. 332 pp.

The loose organization of English University affairs, the lack of coherence in the scheme of the institutions, have had their advantages and disadvantages. When in Cambridge a number of years ago, I met an eminent writer whose original and heterodox ideas about religion had lately been published in a book. "What do the orthodox divines of the University think of him?" I asked a resident. "They do not even know that he exists!" Perhaps that was a slight exaggeration, but the independence of the teachers is such that they do very nearly as they please, and wax or wane in reputation and even income according to their ability to command attention or win support. The centrifugal tendency has dominated the intellectual life of the place, increasing with the inevitable specialization of modern times. Each department is, as it were, at the end of a long lane, which no one